California Groundfish Catch Data Collection and Analysis

Starry Flounder (courtesy Ray Troll)

California State Landings (historical and recent) and composition (age, length) data

NOAA FISHERIES

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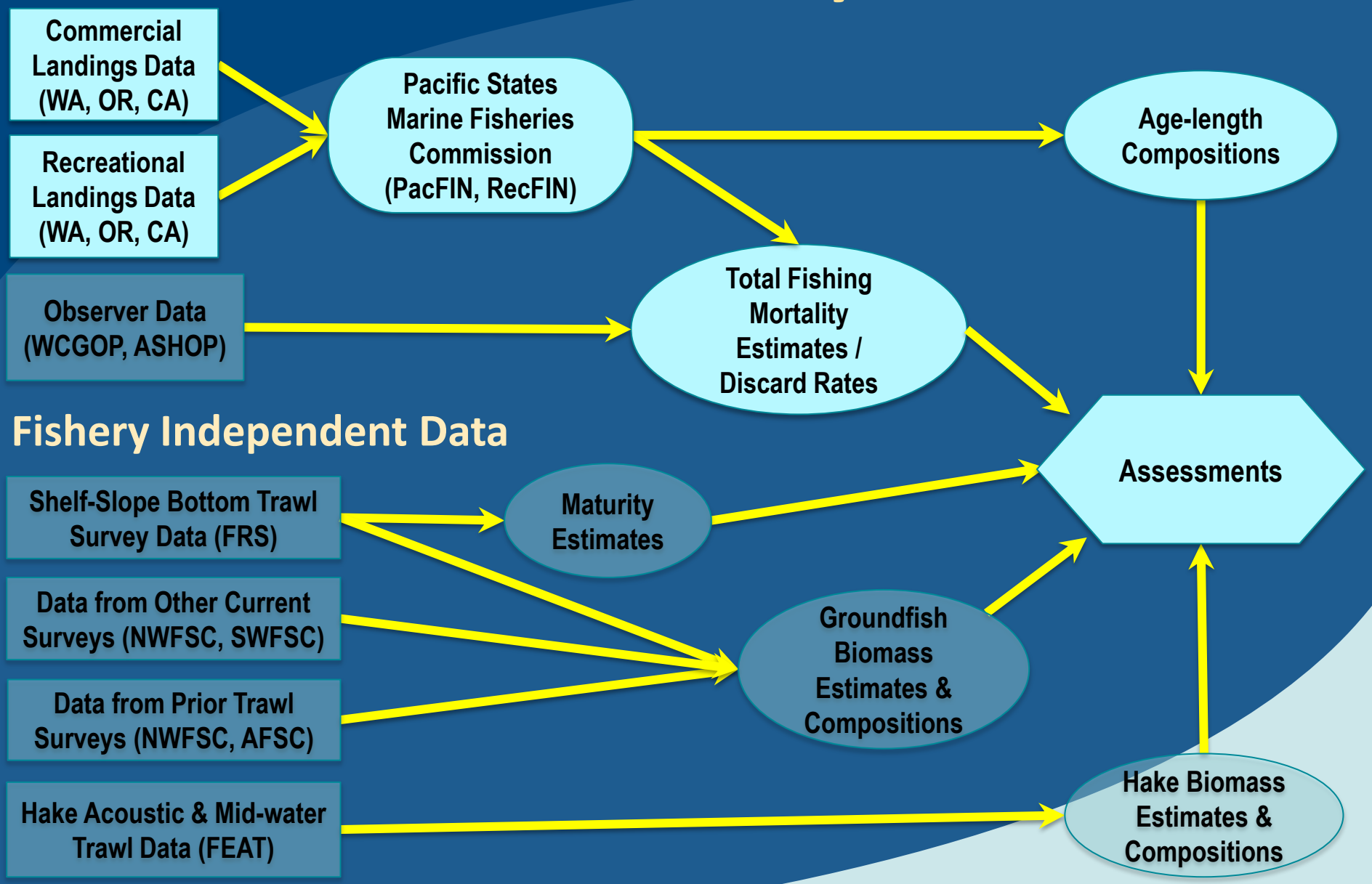
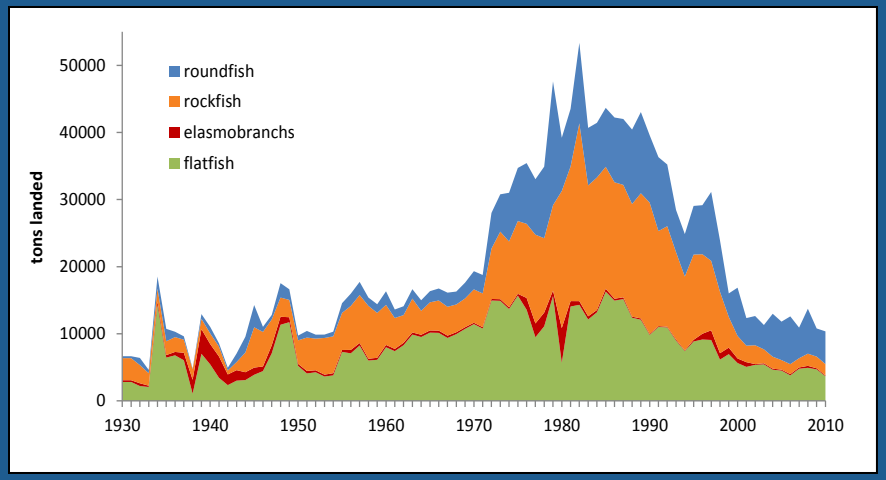
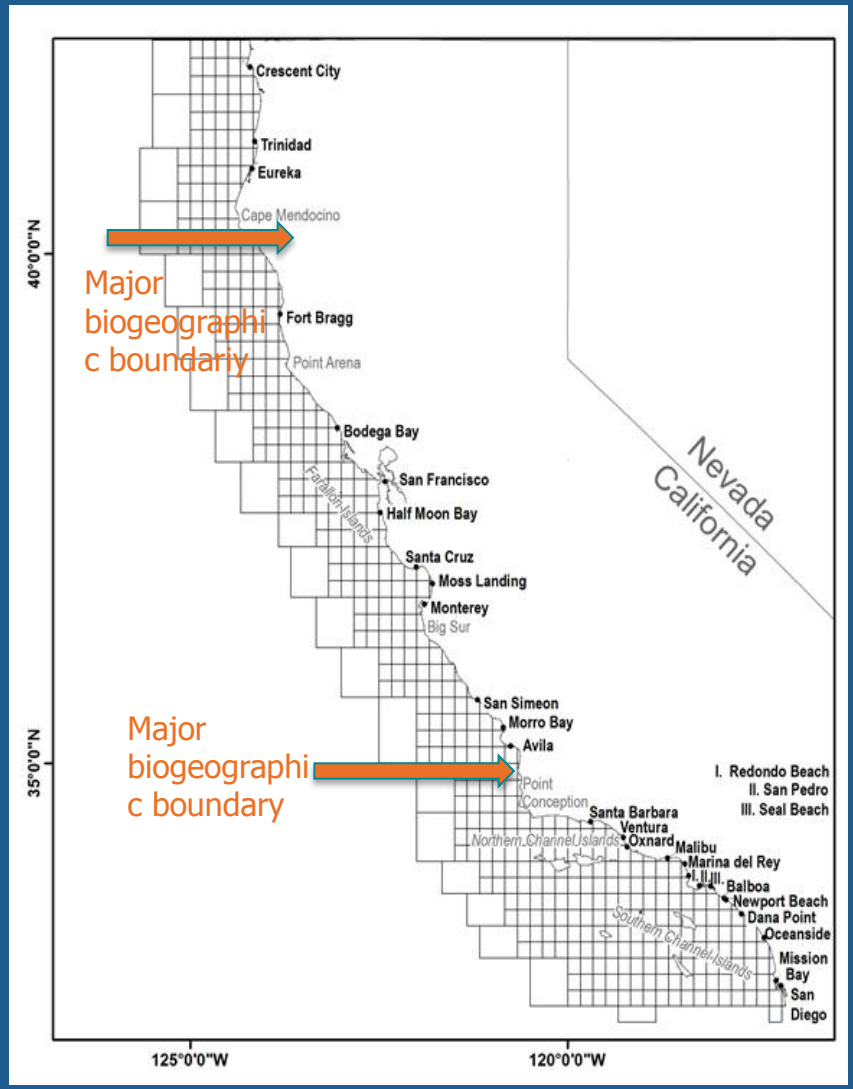
Fishery Data Flows



California groundfish catch data



- Fish ticket system started ~1918
- Block summary data available 1928- 1968, these and early fish ticket data recovery supported by CDMP.
- Trawl logbook data available for 1980-present, some early years (1930-1952)
- Species composition, bio samples only available 1978 onward
- Currently not all port complexes are sampled (10 complexes, 7 full time sampler, 1 part time sampler)



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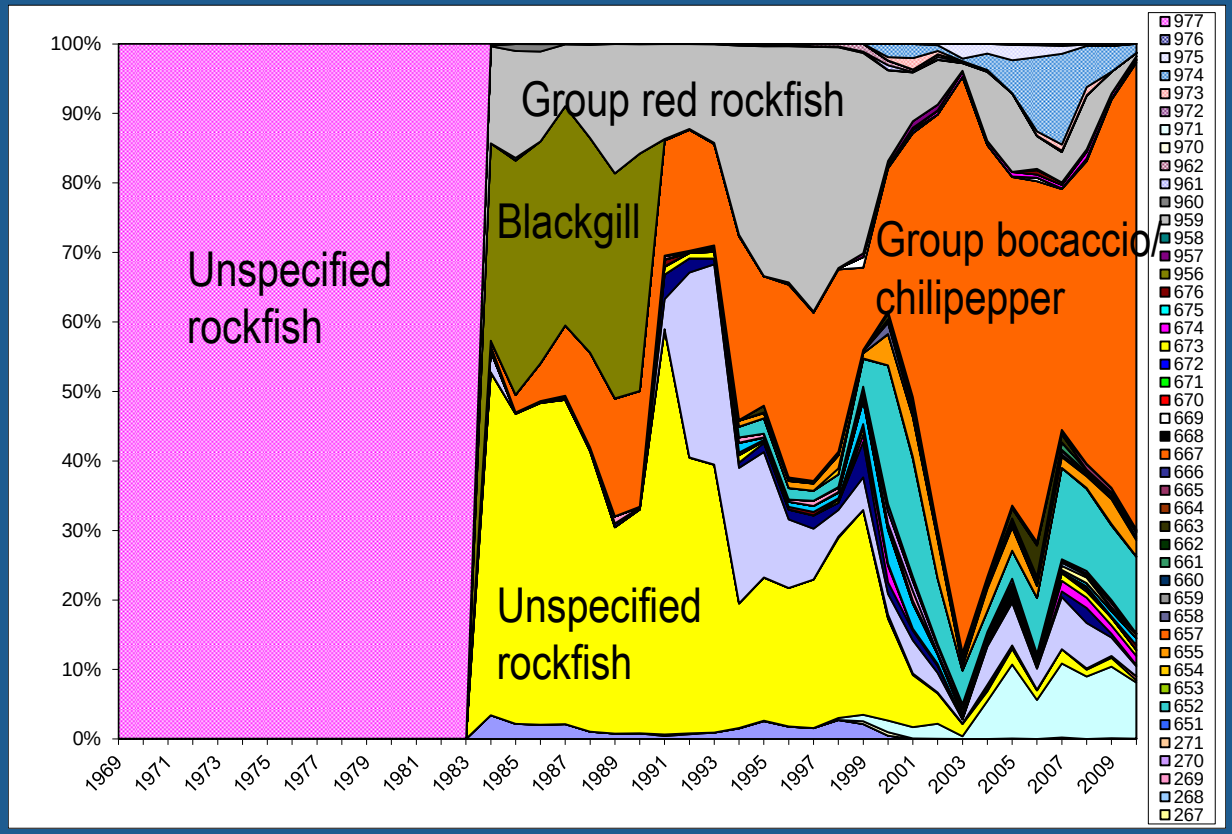
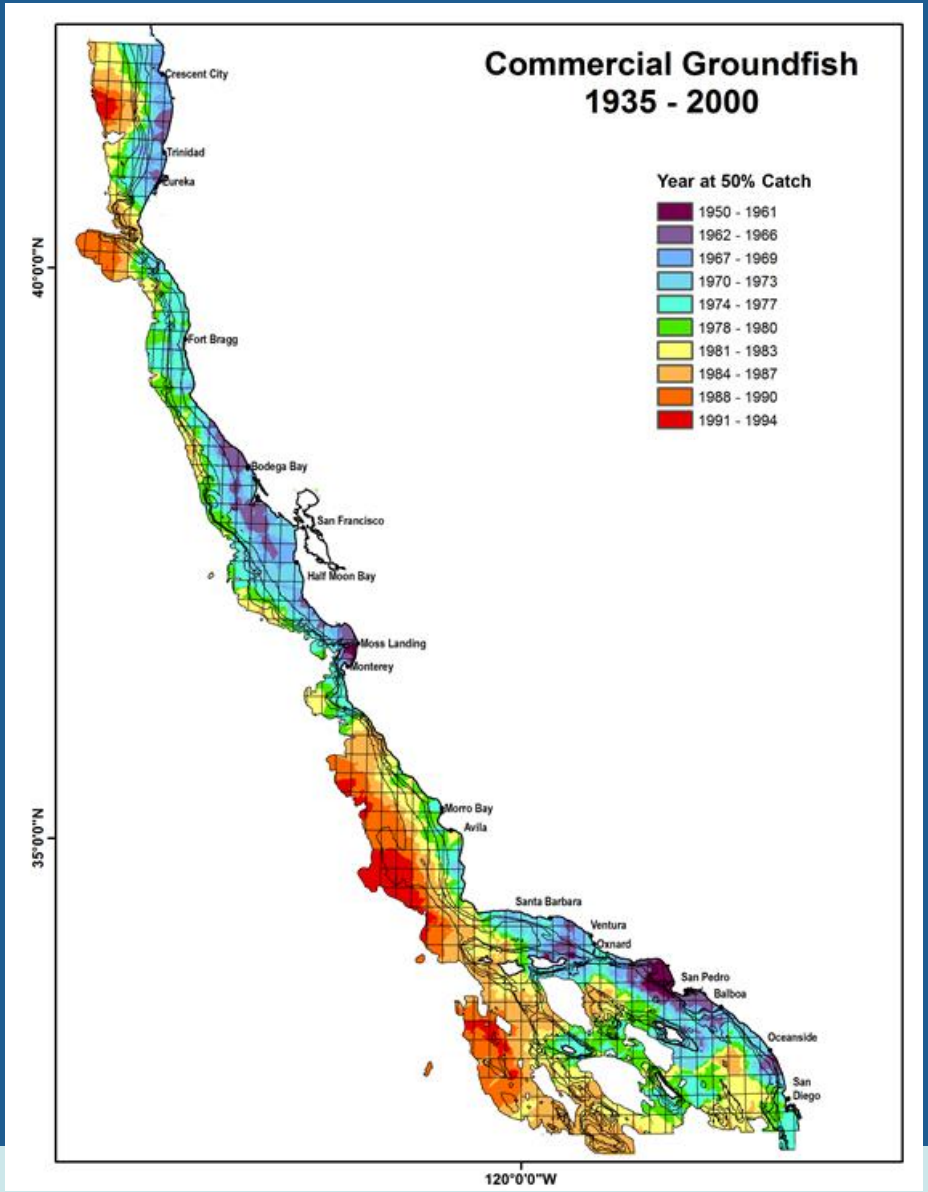
California groundfish catch data



Rockfish market categories have changed over time, complicating efforts to interpret species composition. This example is Southern California commercial rockfish.

California Historical Catch Reconstruction

- Historical records by market category back to late 1920s, some data earlier, but "rockfish" market category mixed
- Catch reconstruction efforts focused on assigning "rockfish" to species level based on recent species composition data (Ralston et al. 2010)
- Currently trying to understand the spatial development of the fishery over time (trend to catches further offshore, deeper water, more inclement weather), to better inform future reconstruction efforts



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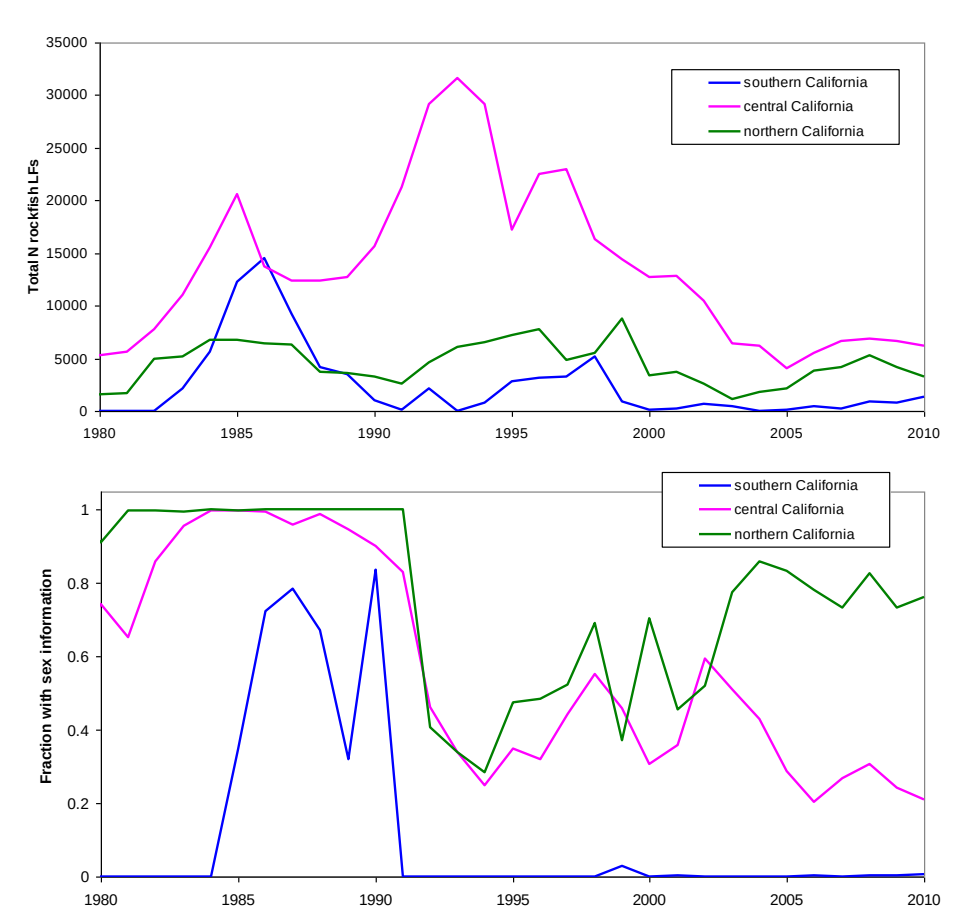
California groundfish catch data

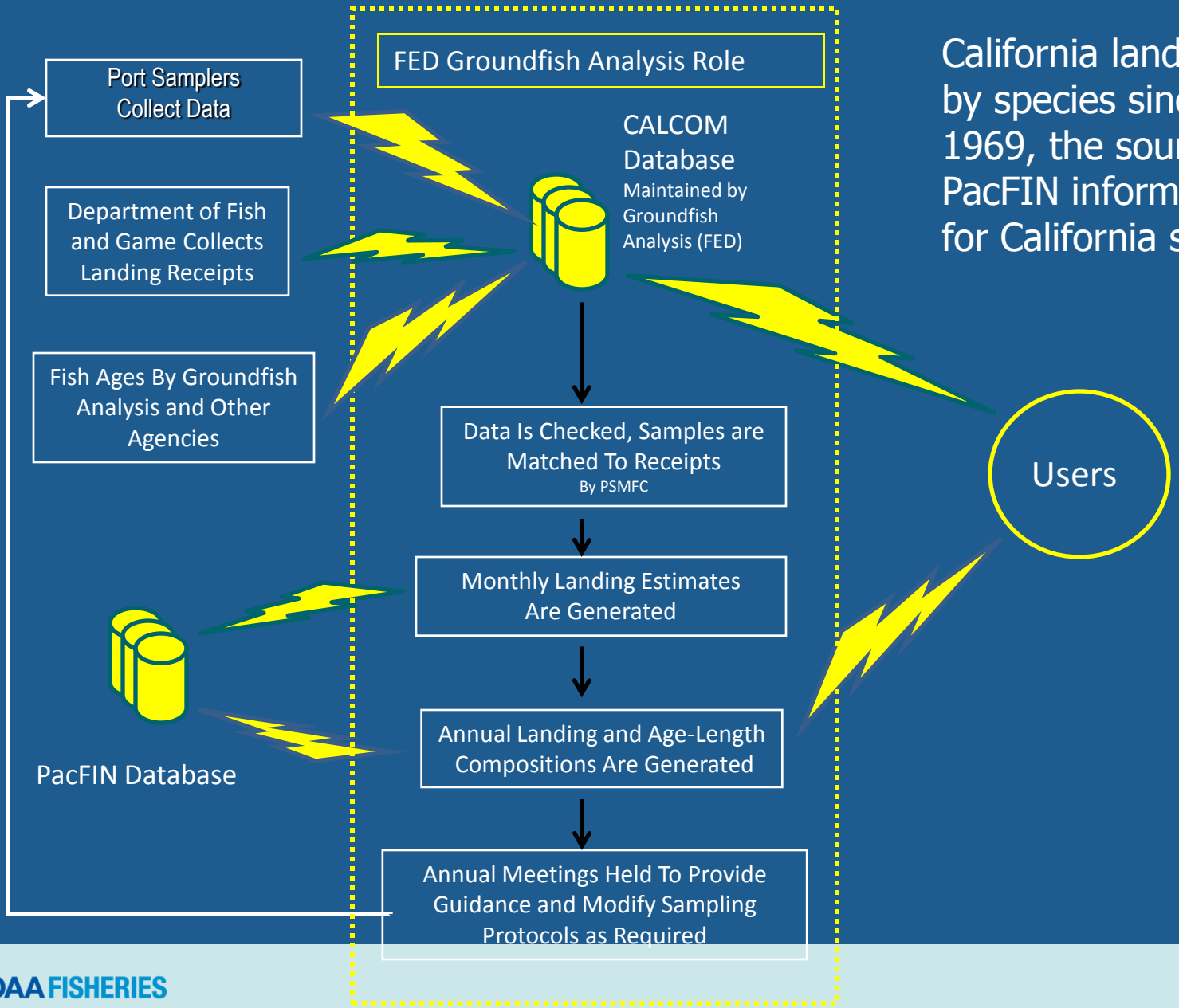
- High degree of heterogeneity in species composition, as well as size or age structure over space, leads to challenges in sampling all market categories or species adequately
- Biological sampling (species comps, length comps, ages, sex/maturity) is done throughout the state by PSMFC port samplers (as in OR, WA)
- However, sampling is **not** mandatory in CA (it is in OR, WA), thus many catches are not sampled or sampled for length only
- Catches of nearshore and live-fish fishery are very poorly sampled



California groundfish catch data

- CalCOM (the California Cooperative Survey) is a CDFW/PSMFC/SWFSC collaboration to generate data from fish tickets and port samplers to PacFIN
- The fish ticket system run by CDFW, port samplers are managed by the PSMFC, the CalCOM database (and expansions; length, age) are managed by SWFSC.
- SQL database and server accessible to CDFW, PSMFC, NOAA through internet as well as VPN/ODBC connections, which allow users to query from a large variety of applications (Excel, Access, SAS, MATLAB, ORACLE, Visual Basic)

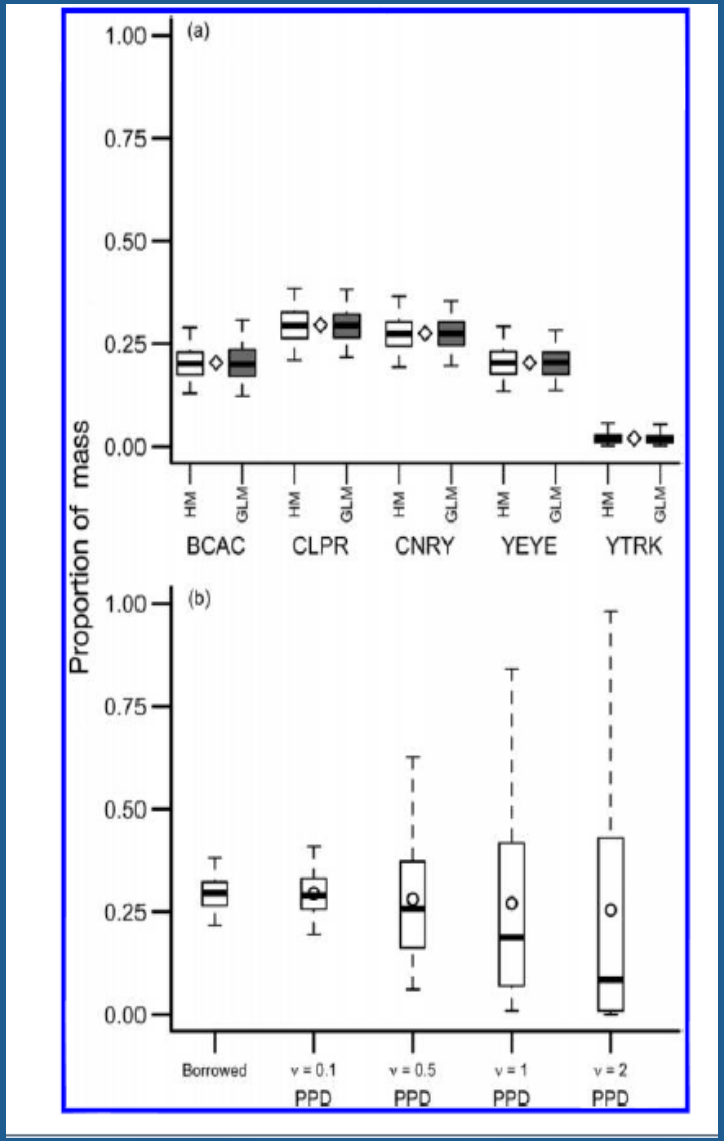
CALCOM Data System



California landings by species since 1969, the source of PacFIN information for California state

From Borrowing to Bayesian

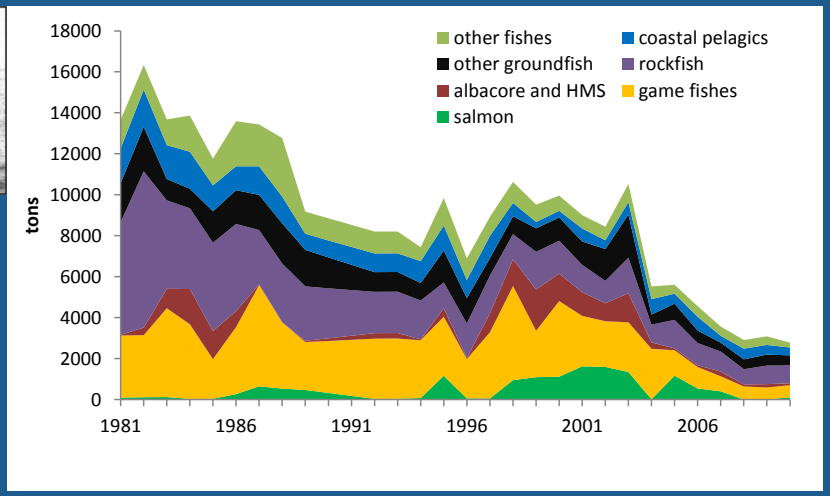
- Currently not all ports, months, gear strata and market categories are sampled, we rely heavily on "borrowing" across strata to provide point estimates of species compositions.
- Shelton et al. (2012) developed a Bayesian approach to estimating species compositions of landing, by modeling the relationships among strata
- Their hierarchical model structure can accommodate more complexity than existing system, which should help account for overdispersed data
- Not yet implemented (more work to be done), but efforts are ongoing



California Recreational Fisheries

Table 1. The trip-type categories for the California Recreational Fisheries Survey (CRFS) and the composition of each category.

Trip-type category	Examples of target species and/or groups in the trip-type category
Anything	Angler targeting 'anything'; unidentified fish; and trips targeting invertebrates where finfish are incidentally caught
Coastal pelagic and coastal migratory species	All species listed in the federal Pacific Fishery Management Council Coastal Pelagic Species Fishery Management Plan (northern anchovy, Pacific mackerel, jack mackerel, and Pacific sardine); and other anchovies, Pacific barracuda, butterfish, flyingfish, jacks (jack family and yellowtail), mackerels (mackerel family, bullet, sierras, and Pacific bonito), Pacific saury, and unidentified surface fish
Highly migratory species	All species listed in the federal Pacific Fishery Management Council Highly Migratory Species Fishery Management Plan, and other billfishes, Pacific cutlassfish, sunfish, other pelagic sharks, pelagic stingray, and other tunas
Nearshore hard bottom, kelp beds, and shelf/slope hard and soft bottom	All species listed in the federal Pacific Fishery Management Council Groundfish Fishery Management Plan except leopard shark, California skate, sand sole, and starry flounder; all species listed in the California Nearshore Fishery Management Plan; and unidentified bottomfish or groundfish, blacksmith, black croaker, white seabass, other flounders, sea chubs, groupers, grunts, Pacific halibut, sea basses (except spotted sand bass), giant sea bass, kelpfishes, sculpins, wrasses, ocean whitefish, some surfperches (black, kelp, pink, rainbow, reef, sharpnose, and striped), and other flatfish and sharks found in the nearshore over hard bottoms and offshore
Shore and nearshore soft bottom	Leopard shark, California skate, sand sole, starry flounder, croakers/drums (except black croaker and white seabass), herring, spotted sand bass, smelts, and silversides; sharks, skates, rays, and flatfish found over nearshore soft bottoms; and the following surfperches: barred, calico, dwarf, pile, redtail, rubberlip, shiner, silver, spotfin, walleye, and white
Salmonids	Salmon (chinook, coho, pink, chum, and sockeye) and steelhead
Other anadromous species (non-salmonid)	Striped bass, lampreys, shad, and sturgeons
Invertebrates	Fishing trips where invertebrates are the primary target and no finfish are caught.



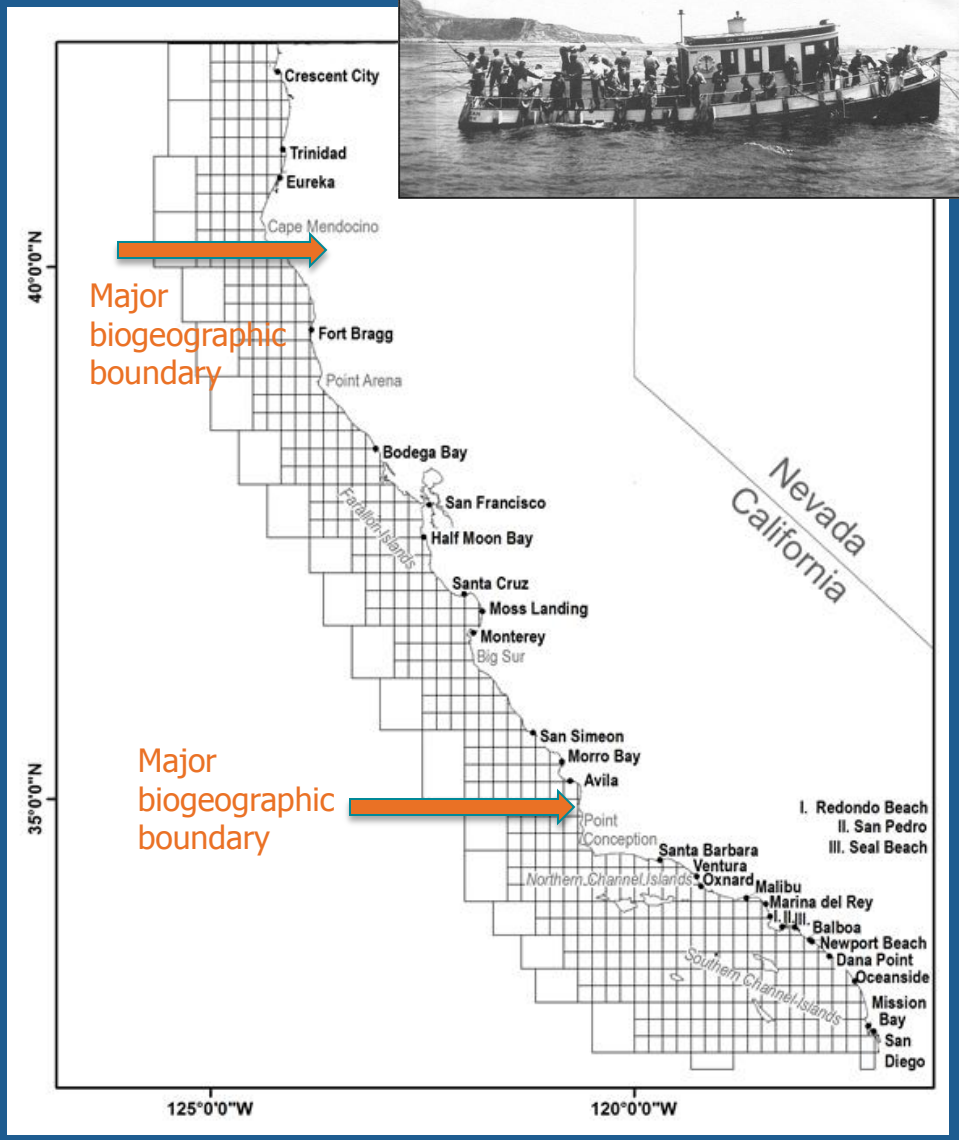
California's CPFV fleet is among the largest in the world, started 1920s. In 2009, estimated that 1.5 million saltwater anglers did 4.7 million trips, spent $1.6 billion dollars*

A wide range of fisheries targets, and several major biogeographic boundaries, makes monitoring recreational fisheries particularly challenging

*http://www.nmfs.noaa.gov/stories/2011/12/docs/action_agenda_sw.pdf

Recreational Fisheries: CPFV logbooks

- Commercial Passenger Fishing Vessels (CPFV) have been required to report catches in logbooks since the late 1930s
- Compliance has been less than 100%, variable over time and space, but used to reconstruct historical catches
- Most targets reported to species level, however "rockfish" traditionally were not
- Currently part of the basis for total catches in California Recreational Fishing Survey (CRFS) data system



Current CDFW Sampling Methods

Marine Recreational Fisheries Statistics Surveys (MRFSS) (1999-2003)
California Recreational Fisheries Survey (CRFS) (2004-present)

California Recreational Fisheries Survey Methods

by

California Department of Fish and Game

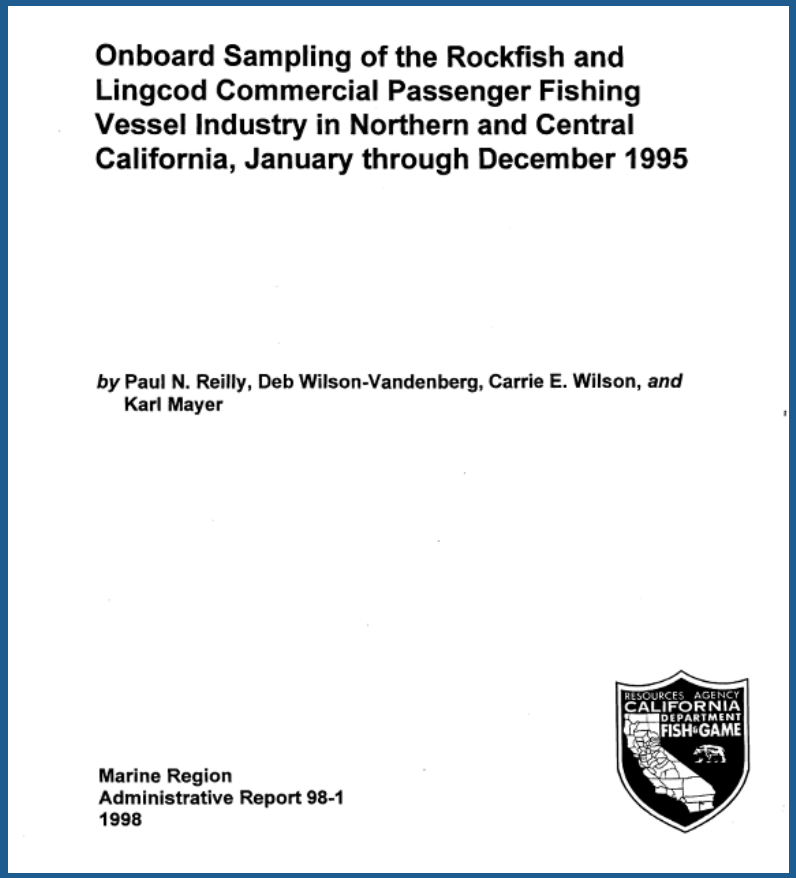
Table 2. Surveys used in the California Recreational Fisheries Survey (CRFS) to collect data on fishing effort (Effort) and catch (fish caught and kept and fish caught and released) rates (catch per unit effort, CPUE).

Mode	Estimate	Public Access (publicly-accessible sites covered by the field surveys)		Private Access (sites not accessible to the general public and not covered by the field surveys)	
		Day ☼	Night ☾	Day ☼	Night ☾
1° Sites Private & Rental Boats	Effort	Field Survey	Under-coverage adjustment [1]	Under-coverage adjustment [1]	Under-coverage adjustment [1]
	CPUE	Field Survey	Use estimate from day	Use estimate from day	Use estimate from day
2°Sites Private & Rental Boats	Effort	Field Survey	Under-coverage adjustment [1]	Under-coverage adjustment [1]	Under-coverage adjustment [1]
	CPUE	Field Survey	Use estimate from day	Use estimate from day	Use estimate from day
CPFV	Effort	CPFV logs and Field Checks[2]	CPFV logs and Field Checks[2]	Not Applicable	Not Applicable
	CPUE	Field Survey (onboard & dockside)	Field Survey (onboard & dockside)		
Man-made Structures	Effort	Field Survey	NO ESTIMATE	NO ESTIMATE	NO ESTIMATE
	CPUE	Field Survey			
Beaches & Banks	Effort	Telephone Survey ALDTS[3]	Telephone Survey ALDTS[3]	Telephone Survey ALDTS[3]	Telephone Survey ALDTS[3]
	CPUE	Field Survey	Use estimate from day	Use estimate from day	Use estimate from day

- Samples all recreationally caught marine finfish in California waters
- Four major modes (CPFV, private/rental, man-made structures, beach/shore), effort focused on vessel modes
- Six major geographic areas, field sampling in over 500 sites – seek balance by area
- Stratified sampling program,
- Intercept sampling of retained catch, length
- Onboard observer data collected
  - Random subset of anglers
  - Drift starting and ending locations,
  - Effort measured to minute
  - All catch from observed anglers
  - Discarded fish lengths

http://www.recfin.org/sites/default/files/documents/CRFS_METHODS_6_9_2011.pdf

Historical Recreational CPFV Data (Southern CA 1975-1978, 1986-1989, Central CA 1978-1998)



Onboard Sampling of the Rockfish and Lingcod Commercial Passenger Fishing Vessel Industry in Northern and Central California, January through December 1995

by Paul N. Reilly, Deb Wilson-Vandenberg, Carrie E. Wilson, *and* Karl Mayer

RESOURCES AGENCY CALIFORNIA DEPARTMENT FISH & GAME

Marine Region
Administrative Report 98-1
1998

- Observer data collected from CPFV trips throughout CA waters during different periods
- Southern CA data has not been used for indices (but has been for LFs, informing catch reconstructions)
- In each region, databases include thousands of trips, hundreds of thousands of fish (species, length)
- Methods comparable to current CRFS, however, database only includes "location-specific" rather than drift-specific data (km v. m resolution)

Strengths

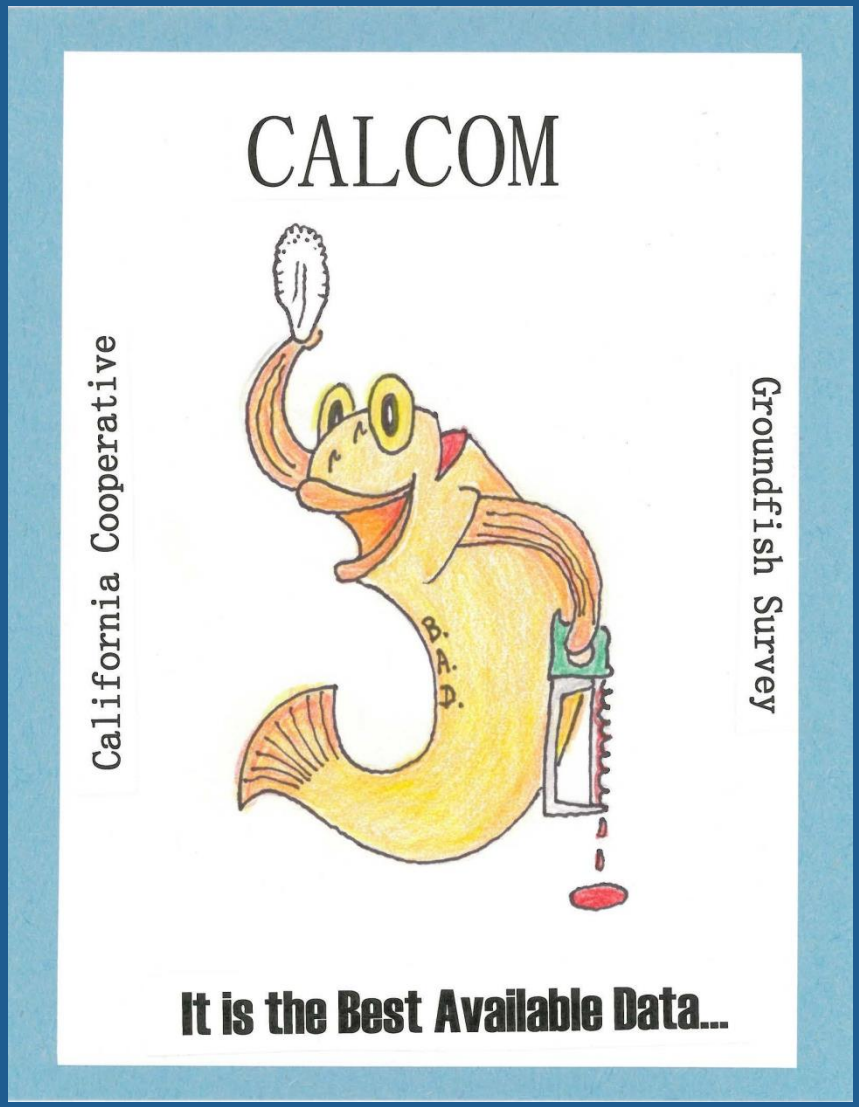
- Historical records of catch for most non-rockfish species (and for rockfish as aggregate) are generally reliable
- Although current sampling levels are declining for commercial fisheries, but landings are also low and most market categories are reasonably well sampled for major ports (but not all)
- Vessel-based recreational catches are well sampled with onboard observers, data available at high spatial resolution

Challenges

- Many important port complexes do not have sampler (or part time), so many ports and strata go unsampled.
- Historical catches of rockfish and some other species group (e.g., skates) lack good species composition, distribution of catch/effort vary over time
- Non-mandatory port-sampling has resulted in absence of biological samples (sex-specific lengths, otoliths) in some regions, increasingly problematic in historically cooperative regions
- Nearshore fishery (particularly live fish) is very poorly sampled; catch, species composition and size composition data are very sparse for these stocks
- Recreational fisheries (CPFV, vessel, shore based) are very important, also diverse, complex, costly and difficult to monitor, with large variability of targets over time and space. Historical catch estimates based on unbalanced sampling

Solutions

- Commercial port samplers need sustained/increased support (PSMFC) to improve sampling effort
- More investment in evaluation of historical catch data is feasible, slowly progressing (faster progress will take more resources)
- CDFW and California Fish and Wildlife Commission have been discussing (with State legislature) legislation to make port-sampling mandatory
- Current monitoring of CPFV and other recreational fleets is extensive, should be maintained (if not expanded...)


CALCOM
California Cooperative
Groundfish Survey
B.A.D.
It is the Best Available Data...